
तिजोरियाँ

भाग 3 अग्नि प्रतिरोधी परीक्षण
(पांचवा पुनरीक्षण)

Safes

Part 3 Tests for Fire Resistance
(Fifth Revision)

ICS 13.310

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BUREAU OF INDIAN STANDARDS
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FOREWORD

This Indian Standard (Part 3) (Fifth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Security Equipment Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

Security equipment plays a vital role in secured storage of valuables and important documents. These are used in a wide variety of establishments like banks, commercial organizations, hotels, shops, etc. One of the most common and important security equipment is safe, popularly used to store cash, valuables and important documents.

The important change in this revision is:

- a) Discrepancy removed between the values for furnace temperatures calculated based on given formula and those given in table, with ambient temperature of 25 °C.

This Indian Standard is published in 3 parts. The other parts in this series are:

Part 1 Specification

Part 2 Tests for burglary resistance

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SAFES

PART 3 TESTS FOR FIRE RESISTANCE

(Fifth Revision)

1 SCOPE

This standard (Part 3) lays down the methods of test for assessing the fire resistance capacity of the safes. Tests conducted in accordance with these requirements are intended to demonstrate the performance of equipment during exposure to fire, but are not intended to determine acceptability for use after exposure to fire.

2 SAMPLE FOR TESTING

Two samples, known to be fully representative of a lot of safes of similar design and construction, shall be subjected to test. Such samples shall be selected on the basis of random sampling by inspecting agency.

3 TESTS

3.1 Tests for verifying fire resistant property of safes consist of fire endurance test and fire and impact test. For this purpose, one sample each selected in accordance with 2 shall be subjected to 3.4 and 3.5 respectively.

3.2 Test Equipment

3.2.1 Contents

Contents of the safe subjected to these tests shall include currency-note-grade paper. A file, letter, record-form paper (printed, typed or hand written in (files or envelopes).

3.2.2 Thermocouple

Thermocouple enclosed in protection tubes of materials and dimensions shall have time constant of protected thermocouple assembly within the range from 3 to 7.2 min.

3.2.2.1 A typical thermocouple assembly conforming to these requirements may be fabricated by fusion welding the twisted ends of Chromel-Alumel wire not smaller than 0.52 mm² and not larger than 0.82 mm² in cross section.

3.2.3 Furnace

3.2.3.1 The furnace fuel and air supplies shall be adjusted such that the fire is uniformly distributed over the exposed faces of the safe and regulated to

temperatures in accordance with the standard time temperature curve (refer Table in 3.2.3.2).

3.2.3.2 The furnace temperature corresponding to time elapsed as given below, shall follow the equation:

$$T - T_o = 345 \text{ Log}_{10} (8t + 1)$$

where

T = furnace temperature, in °C at any time t in minutes;

T_o = ambient temperature, in °C; and

t = time elapsed.

Time min	Furnace Temperature °C
5	580
10	682
15	743
20	785
25	819
30	846
35	869
40	889
45	906
50	922
55	936
60	949

3.2.3.3 The accuracy of the furnace control shall be such that the area under the time temperature curve, obtained by averaging all the furnace thermocouple readings, shall be within 10 percent of the corresponding area under the standard time temperature curve for one hour.

3.3 Preparations for Tests

3.3.1 The safe to be subjected to fire endurance test shall have a 16 mm diameter through hole at the bottom. A pipe of the same external diameter shall be welded to outer and inner body sheets of the safe. This hole shall be used for insertion of thermocouple wires through the hole; it shall be sealed by proper insulating compound from both ends of the hole.

3.3.2 All thermocouples shall be located 150 mm from the top of the safe interior. Four thermocouples shall be located 25 mm from the side walls, two of these being 150 mm from back and the other two 25 mm from the inner face of the doors. For double door safes, a fifth thermocouple shall be located 25 mm from the inner face of the doors opposite the centre door joint.

3.3.3 The furnace temperature shall be recorded by thermocouples symmetrically distributed. At least four thermocouples shall be used, placed 50 mm from the exposed faces of the test sample including the door face.

3.4 Fire Endurance Test

3.4.1 The sample of safe prepared in manner specified in **3.3.1** is placed in the furnace. The storage area shall then be evenly filled with contents (*see 3.2.1*) occupying volume equal to 20 to 50 percent of the volume of safe. The safe is then locked.

3.4.2 The thermocouples to be placed inside the safes shall be mounted in porcelain insulators so that the thermocouple head is 12 mm from the sealed end of a standard mass of nominal 12 mm diameter iron, steel or inconel pipe.

3.4.3 The furnace shall then be put on and the temperatures shall be read at intervals not exceeding 5 min during the test. Average of all the thermocouples inside and outside the safes shall be recorded and shall be taken as the required value.

3.4.4 The pressure in the furnace chamber during the test shall be maintained as close as within +5 percent of the atmospheric pressure.

3.4.5 The furnace fire shall be continued for 30 min. During the fire endurance test, it is essential that at no time the internal temperature of the safe, as shown by any of the thermocouples placed inside the safe shall exceed 177 °C irrespective of ambient temperature.

3.4.6 After the specified period, the furnace is switched off. The safe is continued to be kept in the furnace and temperature of the interior of the sample safe is to be continuously recorded until a definite drop is noted.

3.4.7 After the safe, inside the furnace has cooled to about 47 °C temperature, it shall be taken out from the furnace and its door shall be opened. The contents shall be examined to determine their usability in accordance with 4. The security and integrity of the locking mechanism shall also be checked.

3.5 Fire and Impact Test

3.5.1 The safe to be subjected to this test shall have contents as specified in **3.2.1** and shall be subjected to test without any thermocouple inside the safe.

3.5.2 The safe shall be subjected to a standard fire exposure in a manner similar to the fire endurance test, for the period as shown below:

- a) Exposure time : 15 min
- b) Reheat time : 15 min

3.5.3 After the fire exposure time, the furnace shall be switched off. The safe shall then be hoisted so that its bottom is 4.0 m above a layer of brick rubble (30 cm depth) on a heavy concrete base and then dropped. A maximum of 15 min shall elapse from the time the furnace fire is extinguished till the safe is loaded again into the furnace.

3.5.4 Immediately after the impact, the safe shall be inverted, put back in the test furnace, and again subjected to a standard fire exposure for the period of reheat time indicated in **3.5.2** then the furnace shall be switched off and shall be allowed to cool to less than 47 °C without opening the furnace.

3.5.5 After the safe has cooled to less than 47 °C, the door shall be opened to examine its heat insulating properties, as evident by the usability of the contents and the security and integrity of the locking mechanism.

4 CRITERIA FOR CONFORMITY

The contents of the fire resisting safe shall be considered to be usable after tests, if they are able to withstand ordinary handling without crumbling or falling apart, and legible and reproducible.

ANNEX A*(Foreword)***COMMITTEE COMPOSITION**

Security Equipment Sectional Committee, MED 24

<i>Organization</i>	<i>Representative(s)</i>
Reserve Bank of India, Mumbai	SHRI D. K. RAGHU (Chairman)
Bank of India, Mumbai	CAPT AKHILESH KUMAR
Central Building Research Institute, Roorkee	DR SUVIR SINGH DR RAJIV KUMAR (<i>Alternate</i>)
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Indian Banks Association, Mumbai	SHRI K. UNNIKRISHNAN
Indian Overseas Bank, Chennai	CAPT P. VENKATESAN
Indian Institute of Technology, Bombay, Mumbai	PROF P. P. DATE
Insurance Regulatory and Development Authority, New Delhi	SHRI T. S. NAIK
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Voluntary Organization in Interest of Consumer Education, New Delhi	SHRI M. A. U. KHAN
In Personal Capacity (<i>Plot No. 41, Block No. 5, Mehta Cottage, Dr Raut Road, Shivaji Park, Dadar, Mumbai</i>)	SHRI AJIT G. NARAVANE
BIS Directorate General	SHRI RAJNEESH KHOSLA, SCIENTIST 'E' AND HEAD (MED) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

Member Secretary

MS KHASHBOO KUMARI
SCIENTIST 'C' (MED), BIS

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